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From: General Aviation Human Factors Program Manager, ATO-P HF R&D
To: General Aviation Human Factors TCRG, (POC: Anne Graham, AFS-800)

Subj: Ultra-fine Grained Analysis of General Aviation Accidents 1990-present

Ref: (a) General Aviation TCRG February 02, 2005 meeting minutes
(b) General Aviation requirement entitled "Ultra-fine Grained Analysis of General Aviation Accidents 1990-present"

Requirement background: Per references (a) and (b), FAA sponsoring offices considered the "Ultra-fine Grained Analysis of General Aviation Accidents 1990-present" the top "pop-up" FY05 and FY06 research requirement. As part of the FAA's endeavor to better understand the human causes of GA accidents, the FAA/Civil Aerospace Medical Institute (CAMI) and the University of Illinois have analyzed fifteen years (1990-2004) of general aviation (GA) accidents using the Human Factors Analysis and Classification System (HFACS). The findings have identified that among the unsafe acts of aircrew, skill-based errors account for roughly 3 out of every 4 accidents, followed by decision errors (28%), violations (13%), and perceptual errors (5%). In the last collaborative effort, these analyses were extended to identify the general types of errors within each causal category (i.e., a fine-grained analysis of GA accidents). For example, it was determined that the top skill-based errors included technique errors such as the loss of directional control on the ground, management of airspeed, loss of control in-flight, and compensation for winds. While these analyses provide the most comprehensive examination of the human causes associated with GA accidents to date, more information about the specific operational and individual pilot factors associated with each unsafe act is needed to generate targeted interventions. As a result, AFS-800 has requested that a more in-depth "ultra" fine-grained analysis be performed on the top aircrew unsafe acts so that effective interventions can be developed as part of requirement entitled "A New Approach to Aviation Accident/Incident Prevention/Mitigation".

1) The project will be executed as follows:

FY06 tasks:

i. Meet with AFS-800 to determine the order of ultra-fine grained analyses. Specifically, the meeting will determine which HFACS error category (e.g.,

skill-based errors, decision errors, perceptual errors, violations) will be analyzed in the first and subsequent years of the task.

- Constant dialog between AFS-800, ATO-P HF R&D, CAMI, and grantees will occur to avoid duplicative efforts. Every effort will be made to ensure the project will complement and enhance ongoing work to make certain that this project does not result in a separate (and possibly conflicting) deliverables.

ii. Conduct ultra-fine grained analysis of first HFACS error category. For instance, within skill-based errors the top four error types identified at the 2004 GA Program Review involved: 1) *control of the aircraft on the ground*, 2) *management of airspeed*, 3) *control of the aircraft in the air*, and 4) *compensation for winds*. Each of these error types would be further evaluated using traditional demographic (IMC/VMC, time of day, flight hours, etc.) and human factors data (e.g., the preconditions for unsafe acts, unsafe supervision, organizational influences within HFACS) to identify specific areas of interest for identification of intervention strategies using the Human Factors Intervention Matrix (HFIX). The data will also be used to focus existing safety programs within the FAA.

iii. At the end of each year, an update of the HFACS data will be provided to the sponsors similar to that provided at the FY04 General Aviation Program Review. This update will provide vital information as subsequent years of this effort are evaluated. For instance, while skill-based errors and the error types associated with that category may be of highest importance to the sponsor in FY06, the specific HFACS category (e.g., skill-based errors, decision errors, etc.) and/or specific error types (e.g., compensation for winds, in-flight decision making, etc.) may change due to updated accident trends or FAA priorities.

iv. Quarterly (December, March, June, September) research progress status reports: Informal e-mail reports from the program manager aviation maintenance human factors to Robert Wright (General Aviation Human Factors TCRG representative).

v. Annual Report: An annual report summarizing year's activities by the grantee will be submitted. This annual report including other human factors general aviation projects sponsored by General Aviation TCRG will be electronically submitted to members of the committee.

- The grantee will submit an annual report using ATO-P HF R&D's Productivity Report website (http://www.hf.faa.gov/report/) to the ATO-P HF R&D general aviation human factors program manager.

Subsequent Year(s) Task(s)

i. At the beginning of each successive year of the project, the grantee will coordinate with AFS-800 sponsors and the contract monitor to determine which HFACS error category and error types to examine.

ii. The analyses and reporting procedures will be the same as ii-v outlined in FY06 above.

iii. Past history associated with the initial HFACS and HFACS fine-grained analysis collaborative agreements suggests that during the execution of this effort, related pop-up efforts may arise. For example, the most recent collaborative agreement between CAMI and the University of Illinois saw a number of "pop-up" requirements involving the HFACS analysis of sightseeing/air tour accidents, emergency medical services (EMS) flights, CFIT accidents, and a comparison of Alaska GA accidents with the rest of the U.S. As such, the execution plan may be amended to include these "pop-up" requirements as they arise.

3). Deliverables:

i. Annual and interim reports as well as briefings addressing the ultra-fine grained analysis of selected aircrew human factors as determined by the sponsor (AFS-800) and contract monitor.

ii. Annual update of HFACS and fine-grained analysis of GA data.

iii. A final report containing a summary of all analyses of selected GA aircrew human factors data conducted during the duration of the grant. The Final Report will be formatted to permit development of appropriate guidance material by AFS-800. These data will provide:

- The sponsor with recommendations as to where selected interventions should be focused

- The seed data for the development of additional interventions using the Human Factors Intervention Matrix (HFIX).

iv. Additional reports and briefings as needed to address "pop-up" requirements

4). Schedule:

- Monthly telephone meetings will be conducted between the investigator, ATO-P HF R&D, and AFS-800 POC. The purpose of the telephone meetings will be to monitor the project's progress and to obtain sponsor feedback.

- Project time line (three year duration). Note: it is unclear how quickly each error category can be fully analyzed. The schedule is a conservative "best guess" based on

previous analyses and may pick up pace after the first year depending on additional "pop-up" analyses.

i. Year 1
   - Month 1: Meet with AFS-800 sponsors and contract monitor to determine HFACS category area of interest and extent of analysis.
   - Month 2-7: Conduct ultra-fine grained analysis of selected aircrew errors using HFACS and selected demographic data.
   - Month 10: Conduct briefing and deliver draft report to sponsor.
   - Month 11: Provide final report of ultra-fine grained analysis of selected HFACS category of interest to sponsor.
   - Month 12: Provide annual HFACS update to AFS-800 sponsors, ATO-P HF R&D program manager, and grant/contract monitor.

ii. Year 2
   - Month 1: Meet with AFS-800 sponsors and contract monitor to determine the next HFACS category area of interest and extent of analysis.
   - Month 2-7: Conduct ultra-fine grained analysis of selected aircrew errors using HFACS and selected demographic data.
   - Month 10: Conduct briefing and deliver draft report to sponsor.
   - Month 11: Provide final report of ultra-fine grained analysis of selected HFACS category of interest to sponsor.
   - Month 12: Provide annual HFACS update to AFS-800 sponsors, ATO-P HF R&D program manager, and grant/contract monitor.

iii. Year 3
   - Month 1: Meet with AFS-800 sponsors and modify execution plan as necessary to complete the remaining HFACS causal categories of interest.
   - Month 2-7: Conduct ultra-fine grained analysis of selected aircrew errors using HFACS and selected demographic data.
   - Month 10: Conduct briefing and deliver draft report to sponsor.
   - Month 11: Provide final report of ultra-fine grained analysis of selected HFACS category of interest to sponsor.
   - Month 12: Provide annual HFACS update to AFS-800 sponsors, ATO-P HF R&D program manager, and grant/contract monitor.

iv. Pop-up requirements will be completed as determined by AFS-800 sponsors, ATO-P HF R&D program manager, and grant/contract monitor.

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